

## **DETAILED ACTION**

### ***Drawings***

1. The drawings were received on 10/29/2010. These drawings are acceptable.

### ***Specification***

The following guidelines illustrate the preferred layout for the specification of a utility application. These guidelines are suggested for the applicant's use.

### **Arrangement of the Specification**

As provided in 37 CFR 1.77(b), the specification of a utility application should include the following sections in order. Each of the lettered items should appear in upper case, without underlining or bold type, as a section heading. If no text follows the section heading, the phrase "Not Applicable" should follow the section heading:

- (a) TITLE OF THE INVENTION.
  - (b) CROSS-REFERENCE TO RELATED APPLICATIONS.
  - (c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT.
  - (d) THE NAMES OF THE PARTIES TO A JOINT RESEARCH AGREEMENT.
  - (e) INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC.
  - (f) BACKGROUND OF THE INVENTION.
    - (1) Field of the Invention.
    - (2) Description of Related Art including information disclosed under 37 CFR 1.97 and 1.98.
  - (g) BRIEF SUMMARY OF THE INVENTION.
  - (h) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).
  - (i) DETAILED DESCRIPTION OF THE INVENTION.
  - (j) CLAIM OR CLAIMS (commencing on a separate sheet).
  - (k) ABSTRACT OF THE DISCLOSURE (commencing on a separate sheet).
  - (l) SEQUENCE LISTING (See MPEP § 2424 and 37 CFR 1.821-1.825. A "Sequence Listing" is required on paper if the application discloses a nucleotide or amino acid sequence as defined in 37 CFR 1.821(a) and if the required "Sequence Listing" is not submitted as an electronic document on compact disc).
2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

***Claim Rejections - 35 USC § 112***

3. Claim 23 recites the limitation "the wall" in line 3. There is insufficient antecedent basis for this limitation in the claim. Claim 24 recites the limitation "a mounting plate" in line 4. There is sufficient antecedent basis for this limitation in claim 23.

***Claim Rejections - 35 USC § 103***

4. Claims 1, 2, 5-8, 11, 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hammer. Hammer shows an apparatus comprising a hydrogen separator (40) having a high temperature resistant membrane (42) including a ceramic substrate located in a wall of an inner chamber (10). The separator is operated under over-pressure conditions for separating hydrogen for collection in chamber (10) for use as a fuel (6) in an engine (13). Hot combustion gases from the engine are exhausted through a pipe (21) which is adjacent to the hydrogen separator (40) as shown in Figure 2. While Hammer does not disclose the use of a metal catalytic convertor in the exhaust pipe, concern over emissions is noted in the abstract. Catalytic conversion of exhaust gases produced by combustion, prior to atmospheric discharge, by direct contact with a metal catalyst is notoriously old in the art for the purpose of reducing exhaust gas emission of pollutants, as noted on page 1 of applicant's specification. Accordingly, to have modified Hammer by including a catalytic converter in the exhaust pipe (21) for the purpose of reducing emission of pollutants prior to exhausting the combustion gases would have been obvious to one skilled in the art. With respect to claim 11, please note conventional catalytic converters include insulation material between the catalyst carrier and the surrounding housing in which the carrier is

mounted. With respect to claim 5, welding of the membrane casing (10) to the wall of the modified Hammer exhaust pipe (21) would have been a common mounting technique obviously available to one skilled in the art to support the casing to the pipe. While Hammer does not show tapering the length of the membrane in the direction of hydrogen outlet (45) as recited in claim 6, absent any unexpected results, such would have been an obvious design choice not producing any unexpected results. With respect to claim 7, note the catalytic form (43) is inherently porous/perforated in order to allow gas flow there through and passage of hydrogen through the membrane. With respect to claim 8, Hammer discloses on page 1, paragraph 2 that it is known to heat the catalyst (43) during cold start using a power source, but notes that a disadvantage of such is power consumption. Accordingly, it would have been obvious to use conventional heating means in combination with Hammer, such as the claimed glow plugs, for use in cold starts notwithstanding increasing power costs. With respect to claim 22, Hammer shows a lambda sensor (14) located in the exhaust pipe and a control unit (20) connected to fuel supply valves (8/9) and water supply valve (3). While a controlled supply of combustion air to the engine is not shown as required in claim 22, a controlled air supply for combustion would have been obvious to one skilled in the art for controlling combustion in Hammer in the same manner as the controlled fuel supply.

5. Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hammer (DE 100 19 007 A1) as applied to claims 1,2, 5-8, 11, 21 and 22 above, and further in view of Abe (US 4865630). With respect to claims 3 and 4, the claimed ceramic substrates are very common in the art as noted in the abstract of Abe for

porous membrane production purposes, and would have been an obvious ceramic material for use as the ceramic substrate in Hammer.

6. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hammer (DE 100 19 007 A1) as applied to claims 1,2, 5-8, 11, 21 and 22 above, and further in view of Fedor (US 3998599) or Cornelier (US 1595711). Baffle plates located at the upstream and downstream ends of the catalytic carriers of catalytic converters are common for mounting purposes and end face protection as shown in Fedor (31) or Cornelier (3). Accordingly, to have provided such means, as recited in claim 9, as a means of mounting and end face protection of the catalytic carrier body in the modified apparatus of Hammer would have been obvious to one skilled in the art since such would have merely constituted the use of well known means for its intended purpose.

7. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hammer (DE 100 19 007 A1) as applied to claims 1, 2, 5-8, 11, 21 and 22 above, and further in view of Abe et al. (US 4280926) or Toh et al. (US 4220625). Catalytic carrier bodies in the form of lamellated blocks, having passages located between the individual plates coated with metallic catalysts are conventional arrangements in the art as shown in Abe et al. (column 6, lines 7-15) or Toh et al. (column 5, lines 15-27). Accordingly, providing a conventional catalytic carrier, such as that recited in claim 10 and shown in Abe et al. or Toh et al., in the modified apparatus of Hammer would have been obvious to one skilled in the art since such would have merely constituted the use of well known means for its intended purpose. Please note that a lamellated block, by common definition, comprises lateral division of distinct plates having flow ducts located there between.

8. Claims 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hammer (DE 100 19 007 A1) as applied to claims 1,2, 5-8, 11, 21 and 22 above, and further in view of Frost et al. (US 2002/0124723). The Hammer disclosure does not provide much elaboration on the specific design of the membrane arrangement encircling the exhaust gas pipe (21). It is known to use multiple assemblies (10) comprising multiple membranes (38,62) interconnected using a serial arrangement of metal retainer plates (12,20) and gaskets (16, 30) as best shown in Fig. 6 of Frost et al. for separating hydrogen from a mixture of gases containing hydrogen. The individual assemblies are retained at their outer edge by brazing or forming a weld joint (74). To have modified the hydrogen separator (40) of Hammer by including multiple membranes, in a manner taught by Frost et al., in the inner chamber (10) of Hammer would have been obvious to one skilled in the art with the expectation of producing additive hydrogen separation and recovery results, if any. With respect to claim 23, modifying the welding manner of securement by bolting the individual assemblies together and to the exhaust pipe and chamber wall (40) would have been obvious to one skilled in the art for attaching the various parts together.

***Double Patenting***

10. Applicant is advised that should claim 1 be found allowable, claim 21 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing

one claim to object to the other as being a substantial duplicate of the allowed claim.

See MPEP § 706.03(k).

### ***Response to Arguments***

11. Applicant's arguments filed 10/29/2010 have been fully considered but they are not persuasive.

Applicant's argument that the Hammer apparatus functions completely different from the claimed regenerator in that combustion exhaust gases are regenerated has been noted. In response to applicant's arguments, the recitation "of combustion exhaust gases" (claim 1) and/or "for combustion exhaust gases" (claim 21) has not been given patentable weight because the recitation occurs in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

The present claims, which are directed to an apparatus and not an intended use of the apparatus, require the catalytic converter to be adjacent the membrane. As set forth in the rejection under 35 U.S.C. 103(a), the membrane of Hammer is adjacent the exhaust gas pipe. It was further noted that Hammer does not disclose the use of a metal catalytic convertor in the exhaust pipe, although concern over emissions is expressed in the Hammer abstract. Catalytic conversion of exhaust gases produced by combustion, prior to atmospheric discharge, by direct contact with a metal catalyst is notoriously old

in the art for the purpose of reducing exhaust gas emission of pollutants, which was pointed out as being noted on page 1 of applicant's specification. Applicant has failed to present any convincing arguments that would rebut the obviousness of modifying Hammer by including a catalytic converter in the exhaust pipe (21) for the purpose of reducing emission of pollutants prior to exhausting the combustion gases.

Applicant has not pointed out any distinguishing structural elements or features between the presently claimed apparatus and the modified apparatus of Hammer as set forth in the prior art rejections of record.

As applicant has chosen not to separately argue the patentability of the dependent claims, their patentability will stand or fall with that of independent claims 1 and 23.

### ***Conclusion***

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOYE L. WOODARD whose telephone number is (571)272-6246. The examiner can normally be reached on Monday - Friday, 8:00 am - 4:30 pm, est.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill Warden can be reached on (571)272-1267. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/JOYE L WOODARD/  
Examiner, Art Unit 1773

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